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ABSTRACT

This reading list for planetary and space science presents general references and bibliographies intended to supply background to the non-scientist, as well as more specific sources for recent discoveries. Included are NASA publications and those which have been commercially produced. References are sectioned into these topics: (1) general reviews of astronomy and space sciences; (2) NASA spaceflight (history); (3) man in space; (4) the solar system; (5) the planets; (6) asteroids, meteorites, tektites, and cosmic dust; (7) comets; (8) space habitats and nonterrestrial resources; (9) origin of life/extraterrestrial life; and (10) UFO's. (CS)

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The Explorer's Guide to the Universe

A Reading List for Planetary and Space Science

NASA

PLANETARY MATERIALS
PLANETARY DIVISION
OFFICE OF SPACE SCIENCE

NASA HEADQUARTERS
WASHINGTON DC 20546

SE 034 588

THE EXPLORER'S GUIDE TO THE UNIVERSE

A Reading List for Planetary
and Space Science

Compiled by

Sandy Zucker
Bevan M. French
Gordon A. McKay

Planetary Materials
Planetary Division
Office of Space Science
NASA Headquarters
Washington, DC 20546

CONTENTS

		Page
	PREFACE	i
1.	ASTRONOMY AND SPACE SCIENCES - Reviews, General Textbooks.	1
2.	NASA SPACEFLIGHT - History	4
3.	MAN IN SPACE- Apollo, Skylab, Others (history, science results)	6
4.	SOLAR SYSTEM - (Origin, History, Planetology): reviews and general textbooks	11
5.	SUN	15
6.	MERCURY	18
7.	VENUS	19
8.	EARTH (from space)	20
9.	MOON	23
10.	MARS	27
11.	JUPITER (and other major planets)	31
12.	SATURN	32
13.	URANUS, NEPTUNE and PLUTO	33
14.	ASTEROIDS, METEORITES, TEKTITES, AND COSMIC DUST	34
15.	COMETS	38
16.	SPACE HABITATS AND NONTERRESTRIAL RESOURCES	39
17.	ORIGIN OF LIFE/EXTRATERRESTRIAL LIFE	42
18.	UFO's	47

*Especially suitable for general or introductory reading by non-scientists and science students.

PREFACE

During the last decade, both scientists and the public have been engulfed by a flood of discoveries and information from outer space. Distant worlds have become familiar landscapes. Instruments in space have shown us a different Sun by the "light" of ultraviolet radiation and X-rays. Beyond the solar system, we have detected a strange universe of unsuspected violence, unexplained objects, and unimaginable energies. We are completely remaking our picture of the universe around us, and scientists and the general public alike are curious and excited about what we see.

The public has participated in this period of exploration and discovery to an extent never possible before. In real time, TV screens show moonwalks, the sands of Mars, the volcanoes of Io, and the rings of Saturn. But after the initial excitement, it is hard for the curious nonscientist to learn more details or even to stay in touch with what is going on. Each space mission or new discovery is quickly skimmed over by newspapers and TV and then preserved in technical journals that are neither accessible nor easily read by the average reader.

This reading list is an attempt to bridge the gap between the people who make discoveries in space and the people who would like to read about them. The aim has been to provide to many different people--teachers, students, scientists, other professionals, and curious citizens of all kinds--a list of readings where they can find out what the universe is like and what we have learned about it. We have included sections on the objects that seem to be of general interest--the Moon, the planets, the Sun, comets, and the universe beyond. We have also included material on related subjects that people are interested in--the history of space exploration, space habitats, extraterrestrial life, and UFO's.

The list is intended to be self-contained; it includes both general references to supply background and more specific sources for new discoveries. Although the list can be used by a wide range of people, it has been compiled with the nonscientist specifically in mind. As a general rule, we have not included technical symposia or the special issues of scientific journals. The reader who wishes to get into that level of detail can get suggestions from the other references

in this list or from more specialized technical bibliographies that are available. In selecting the entries, we have also made a special point of including nontechnical sources that are especially suitable for the young student or the general reader. These are indicated by an asterisk (*) beside the entry.

In the rapidly changing field of space science, almost any reading list will become incomplete even before it is printed. We have not attempted to provide a complete or exhaustive list of references, and many recent books are not included. In addition, it is still too early to provide much basic material for three recent exciting events in planetary exploration: the Pioneer Venus Orbiter-Probe rendezvous with Venus (December 1978 and continuing), the Voyager 1 and 2 encounters with Jupiter (March and July 1979), and the Pioneer Saturn flyby of the seventh planet (September 1979). The "early look" results have been presented in many articles, both technical and popular, but the synthesis of the data and the appearance of review publications is still slightly in the future.

The list includes both NASA publications and those which have been commercially produced. The NASA publications, indicated by SP (Special Publication) and EP (Educational Publication are generally available from the U.S. Government. For information, write: Superintendant of Documents, U.S. Government Printing Office, Washington, DC 20402.

We hope that this reading list will be useful to the wide variety of people who share a common enthusiasm for the exploration of space. We would be glad to have your comments, criticisms, and suggestions.

Bevan M. French
Discipline Scientist
Planetary Materials, SL-4
NASA Headquarters
Washington, DC 20546

Phone: 202/755-3760

ASTRONOMY AND SPACE SCIENCES - Reviews, General Textbooks:

Baade, W. (1975-orig:1963) Evolution of Stars and Galaxies, MIT Press, 321p.

Cameron, A. G. W., (Edit.) (1973) Cosmochemistry, D. Reidel Publishing Co., Boston, 173p.

*Friedman, H. (1975), The Amazing Universe, Washington, D.C., National Geographic Society, 199p., $5.95.
Abs.: An excellent introductory book about current astronomy for the non-scientist. Beautifully illustrated in typical National Geographic style, this book describes in entertaining, non-technical language the astonishing and violent universe that surrounds us. After briefly introducing the history and instruments of astronomy, the book describes new discoveries about a variety of familiar and unfamiliar things--the Sun, families of stars, neutron stars, black holes, galaxies, the Big Bang, and the search for extraterrestrial life. There are brief but clear descriptions of the "new" astronomy that uses other kinds of "light"--radio waves, X-rays, and gamma rays. The author, a noted astronomer himself, also includes photographs and anecdotes that give a feeling for how astronomers actually do their work.

Glasstone, S. (1965) Sourcebook of Space Sciences, D. Van Nostrand, Princeton, New Jersey, 937p.
Abs.: Although much outdated by later discoveries, this book is still a convenient source of valuable information on space exploration: history, fundamental laws, rocket propulsion, the Earth, the Moon, the Sun, other planets and the universe. The technical reader will find it a good introduction to the basic principles and the early exploration of space.

*Hartmann, W. K. (1978) Astronomy: The Cosmic Journey, Wadsworth Publishing Co. Inc., Belmont, California, 536p.
Abs.: The subject of astronomy is explained in its historical context. Astronomical objects are described in an evolutionary sense to illustrate the development of matter in the universe. Related mathematics is not stressed, but is presented in special sections within each chapter as an option for the general reader, or teacher planning a curriculum. Extra material is provided to suggest advanced problems and related projects. The explanations are thorough while maintaining a format that is easy to understand. For further research, a bibliography is provided. This is a good text for high school or college level astronomy courses.

Hess, W. N. (Edit.) (1965) Introduction to Space Science, Gordon and Breach Science Publishers, New York, 919p.

Astronomy & Space Sciences (cont'd)

*Jastrow, R. (1969) Red Giants and White Dwarfs, Signet, New York, 241p. $1.25.
Abs.: A general presentation of present-day theories about astronomy space, and the origin of life.

Kaufmann, W. J., III (1978) Stars and Nebulas, W. H. Freeman & Co., San Francisco, 204p., $7.00.

*Kerrod, R. (1975) The Universe, Warwick Press, 160p., $6.95. (non-technical).

*Maffei, P. (1978) Beyond the Moon, (translation of the Italian "Al Di La' Della Luna," 1973), MIT Press, Cambridge, MA, 377p., $12.50.
Abs.: Somewhere between an astronomy textbook and a popular work, this book is an impressive and readable guided tour through the Universe, led by a well-known Italian astronomer who has discovered two galaxies himself. Beginning at the Moon, the book reaches outward past planets, stars, galaxies and finally to the limits of the universe. Descriptions are balanced with Prof. Maffei's insights and speculations about history, the relations between the universe and the atom, and the landscapes and starscapes of other worlds. Some scientific background will help with the reading, but the book will make for entertaining reading by students, scientists, teachers and especially by other astronomers.

NASA EP-129 (1976) Extragalactic Astronomy, 48p., $1.30.
Abs.: One of four curriculum projects prepared for high school science teachers by the American Astronomical Society, this booklet covers the Universe beyond our Milky Way Galaxy.

NASA EP-128 (1976) Atoms and Astronomy, 32p., $1.20.
Abs.: One of four curriculum projects prepared by the American Astronomical Society for science teachers in secondary schools, this book covers the subject of astronomical spectroscopy. Spectroscopy, the means by which astronomers acquire information about celestial phenomena, is based on the fact that atoms emit and absorb electromagnetic radiation in different ways.

NASA EP-127 (1976) Chemistry Between the Stars, 72p., $1.60.
Abs.: This is one of four curriculum projects for use by secondary school science teachers prepared by the American Astronomical Society. It discusses gases and other phenomena in interstellar space.

NASA EP-126 (1976) The Supernova, 48p., $1.30.
Abs.: This curriculum project is one of four prepared by the American Astronomical Society for use by secondary school science teachers. It discusses one of the most spectacular events in our Universe, events that are said to lead to such phenomena as neutron stars and black holes.

Astronomy & Space Sciences (cont'd)

NASA EP-120 (1977) Quasars, Pulsars, Black Holes and HEAO's, 24p., $.80.
Abs.: Astrophysics, the physics of the stars, takes on exciting new dimensions as the result of recent discoveries in the invisible high energy universe where physical processes are so powerful they cannot be reproduced on Earth.

NASA SP-392 (1976) The Space Telescope, 240p., $2.30.
Abs.: Papers concerning the development of the Space Telescope which were presented at the Twenty-first Annual Meeting of the American Astronautical Society in August 1975 are included. Mission planning, telescope performance, optical detectors, mirror construction, pointing and control systems, data management, and maintenance of the telescope are discussed.

Page, T. and L. W. Page (1976) Space Science and Astronomy: Escape from Earth, Macmillan Publishing Co. Inc., New York, 467p., $13.95.

Pasachoff, J. M. (1979) Astronomy: From Earth to the Universe, W. B. Saunders Co., Philadelphia, Penn., 476p.

Pasachoff, J. M. (1977) Contemporary Astronomy, W. B. Saunders Co., Philadelphia, Penn., 588p.
Abs.: A lengthy, detailed, and up-to-date introductory textbook on current astronomy. The book is notable for the large amount of information about recent planetary discoveries, especially the Viking landings on Mars. The author combines a wealth of astronomical principles and details with a readable text that also contains entertaining highlights about historical events and scientific personalities, and the book is intensely and well illustrated. A good text for the serious student of astronomy.

*Ridpath, I. (1978) Stars and Planets, Hamlyn Pub. Group Ltd, New York, 94p.
Abs.: A beautifully-illustrated "coffee-table" book that neatly summarized the current state of astronomy for the non-scientist. It can be read with pleasure and interest by non-scientists, and it would also serve as an introductory text for younger readers (high school and junior high) interested in astronomy, the planets or our current picture of the Universe. The color illustrations (both space photographs and paintings) and diagrams are particularly impressive.

*Weinberg, S. (1977), The First Three Minutes, Bantam Books, New York, 177p., paperback, $2.50.
Abs.: A fascinating account of how we have been able to provide an answer to one of humanities oldest questions -- "How did the Universe begin?" Written in a clear, simple style by a Nobel Prize winning physicist, this book describes the exciting merger of astronomical observations and nuclear physics theories into the "Big Bang" model of how the universe began in an incredible cosmic explosion about 15 billion years ago. The book traces the evolution of the universe from a dense, expanding "fireball" of light and elementary particles until the first atomic ingredients of the stars were formed some three minutes later. The text in simple and non-mathematical, but the reader will feel more comfortable if he or she has a little background in astronomy and physics.

NASA SPACEFLIGHT - History:

Anderson, F. W. (1976) Orders of Magnitude: A History of NACA and NASA, 1915-1976, NASA SP-4403, 107p., $2.20.
Abs.: A brief history of aeronautics and space exploration is presented. The Federal government's role in contributing, by research and development, to the advancement of aeronautics and space exploration is emphasized. The flight of man is traced from Kitty Hawk to walks and rides on the surface of the Moon. Orbiting Solar Observatories, Orbiting Observatories, planetary exploration (Mariner Space Probes, Pioneer Space Probes), the Earth Resources Program, and Skylab are included. The development of the Space Shuttle is also discussed.

Benson, C. D. and W. B. Faherty (1978) Moonport: A History of Apollo Launch Facilities and Operations, NASA SP-4204, 636p.

Brooks, C. G., J. M. Grimwood and L. S. Swenson, Jr. (1979) Chariots for Apollo: A History of Manned Lunar Spacecraft, NASA SP-4205, 550p., $9.00.
Abs.: This is NASA's narrative history of the Apollo spacecraft, tracing its development and eventual successful completion of its mission, stated by President John F. Kennedy, to carry men to the Moon, and return them safely to Earth before 1970. The story begins with the creation of NASA and ends with Apollo 11, the first of six Apollo missions to land men on the Moon.

*Freeman, Michael (1979) Space Traveller's Handbook: Every-man's Comprehensive Manual to Space Flight, Soverign Books (Simon and Schuster), New York, 208p. $12.95. See under Man in Space for abstract.

NASA Conference Publication 2068 (1978) The Saturn System, 420p. See under SATURN for abstract.

NASA SP-386 (1976) Outlook for Space, 238p.

NASA SP-387 (1976) A Forcast of Space Technology 1980 - 2000.

NASA SP-420 (1977) Voyager to Jupiter and Saturn, 62p. See under JUPITER for abstract.

*Nicholson, I. (1979), The Road to the Stars, New American Library, Inc., Mentor Books ME 1780, New York, 230p., paperback, $2.75.
Abs.: An entertaining, informative book about space exploration -- the accomplishments of the past and the possibilities for the future. The book is a well-balanced mixture of history, techniques, philosophy, and entertaining speculation. The first part is a useful review of the methods and missions of space exploration up to now. This introduction forms a basis for sober and informed speculation about future possibilities--space habitats, terraforming, solar sailing, Interstellar Arks, SETI, the "light barrier", time dilation, and possible faster-than-light travel. A well-written, readable introduction to space travel--past and future--for the general reader.

NASA Spaceflight-History (cont'd)

Space Science Reviews (1977) Voyager Project, V. 21, No. 2 & 3, November-December 1977.
Abs.: Twelve papers providing detailed pre-mission descriptions of the Voyager objectives and investigations, including descriptions of the spacecraft and instruments and discussion of trajectory design. Some of this material is rather technical.

MAN IN SPACE - Apollo, Skylab, Others (history, science results):

Belwe, L. F. (Edit.) (1977) Skylab, Our First Space Station, NASA SP-400, 176p. $7.00.
Abs.: This colorfully illustrated book tells the exciting story of Skylab: its conception and planning; the disastrous beginning when equipment failures almost made the station uninhabitable; the miraculous repairs in space by the first astronaut crews; and the successful use of the station by later astronauts. The book also describes the scientific experiments done aboard Skylab, thus giving a fascinating preview of how people will live and work in space on a permanent basis in the future.

*Collins, M. (1975) Carrying the Fire, Bantam Books, New York, 488p., $1.95.
Abs.: A bibliographical memoir by an Apollo 11 astronaut, describing his progress from test pilot through the Gemini and Apollo missions. An entertaining presentation of the personalities and technicalities involved in going to the Moon.

*Cooper, H. S. F., A House in Space, Holt, Rinehart and Winston, 184p., $8.95.
Abs.: A detailed journal of the Skylab Project, during which astronaut crews lived in a real space station for periods of up to three months. The book is a well-written and entertaining description of what it is like to live and work in space: weightless cooking, exercise, medical treatments, scientific studies, and the strange behavior, in the space environment, of familiar things like water drops, silverware, and spiders.

*Cooper, H. S. F. (1970) Apollo On the Moon, Dial, New York., 197p., $5.95.
Abs.: A journalist's account of the details of the Apollo 11 mission and the first manned exploration of the Moon.

*Cortright, E. M. (edit.) (1976) Apollo Expeditions to the Moon, NASA SP-350, 324p., $8.90.
Abs.: Written by the astronauts and officials involved, this impressively illustrated book tells in fascinating detail the story of the Apollo Program: the decision to go to the Moon, the building of the machines, the Earth-based network that supported the men on the Moon, the lunar discoveries, and the heritage that the Apollo Program has left us.

Man in Space - Apollo, Skylab, Others.. (cont'd)

Ezell, E. C. and L. N. Ezell (1978) The Partnership: A History of the Apollo-Soyuz Test Project, NASA SP-4209, 570p.
Abs.: Correspondence, interviews, official documents, and other published materials were used to trace the evolution of the Apollo-Soyuz Test Project from the initial proposal for international cooperation in space use and exploration until the successful completion of the joint Soviet-American mission. Conceptual drawings of proposed docking modules and mechanisms are presented and discussed. Black and white photographs taken during mission planning and in-flight activities are included with color photographs of the earth taken during the mission. Joint meetings are summarized and the scientific experiments and launch vehicles are discussed in the appendices.

*Freeman, M. (1979), Space Traveller's Handbook: Everyman's Comprehensive Manual to Space Flight, Sovereign Books (Simon and Schuster), New York, 208p., $12.95.
Abs.: A detailed and well-illustrated book that should be required reading for all 21st Century space-travelling scientists, pilots, engineers and ordinary sightseers. The book has extensive sections on Mission Preparation (biomedical requirements, personal equipment, training procedures, and space hazards); Equipment and Spacecraft; Control, Guidance, and Orbital Mechanics; and Space Geography. The tourist will find especially useful the data on space photography techniques, the Seven Wonders of the Solar System, historic sites, and current space settlements. Even stay-at-home, arm-chair explorers will enjoy the extensive compilations of current data about the planets (with the latest photographs), and spacecraft buffs can revel in the detailed information about such ancient vehicles as Apollo, Soyuz, and Shuttle. A good one-volume description of how to travel in space, how we first did it, and how we are doing it now.

*Grey, J. (1979) Enterprise, Morrow, New York, 1V.

Kaplan, M. H. (1978) Space Shuttle: America's Wings to the Future, Aero Pub., Fallbrook, CA, 215p., $14.95.

Lewis, R. S. (1974) The Voyages of Apollo: The Exploration of the Moon, Quadrangle (The New York Times Book Co.), 308p. $12.50.
Abs.: A detailed history of the entire Apollo program and the scientific discoveries made about the Moon, from the first steps of Apollo 11 to the last splashdown of Apollo 17.

Mailer, N. (1970) Of a Fire on the Moon, Signet, New York, 414p. $1.25.
Abs.: An extensive view of the Apollo program and the first lunar landing presented by a well-known novelist-journalist.

Man in Space - Apollo, Skylab, Others.. (cont'd)

NASA EP-123 (1977) Why Man Explores, 96p., $1.10.
Abs.: Transcript of a symposium held July 2, 1976, in conjunction with Viking landing on Mars. Moderated by Norman Cousins, Editor of the Saturday Review. Participants were Captain Jacques Cousteau, explorer-oceanographer; James Mitchener, explorer-author; Dr. Philip Morrison, physicist; and Ray Bradbury, author.

NASA EP-110 (1973) Skylab Experiments, Volume 1, 92p., $1.25.
Abs.: Physical Science, Solar Astronomy. Skylab solar astronomy program is described. Includes a brief description of the Sun's energy characteristics.

NASA EP-111 (1973) Skylab Experiments, Volume 2, 116p., $1.45.
Abs.: Remote Sensing of Earth Resources. All major aspects of remote sensing are covered. Descriptions of individual Earth resources sensors and experiments are included.

NASA EP-112 (1973) Skylab Experiments, Volume 3, 72p., $1.05.
Abs.: Materials Science. Investigations dealing with the effects of weightlessness on melting and resolidification of metal alloys and semiconductor crystals and the combustion of flammable materials are described and related to classroom curricula.

NASA EP-113 (1973) Skylab Experiments, Volume 4, 118p., $1.45.
Abs.: Life Sciences. Covers a wide spectrum of studies pertaining to mineral and hormonal balance; hematology and immunology; cardiovascular status; energy expenditure; neurophysiology; and biology.

NASA EP-114 (1973) Skylab Experiments, Volume 5, 94p., $1.20.
Abs.: Astronomy and Space Physics. Stellar and galactic astronomy, including the mysteries of pulsars and quasars, is coupled with other categories of space research such as phenomena within the solar system and the analysis of near-Earth space.

NASA EP-115 (1973) Skylab Experiments, Volume 6, 40p., $.85.
Abs.: Mechanics. Methods of dealing with two operational spaceflight problems: providing mobility for astronauts, and measuring weight, or mass, in a weightless environment--calls for unconventional techniques and hardware.

NASA EP-116 (1973) Skylab Experiments, Volume 7, 48p., $.90.
Abs.: Living and Working Space. Data are gathered and documented concerning astronaut ability to perform work in long-duration weightlessness and on the habitability features of crew quarters and work stations. An experiment not related to human engineering was one involving web formation by a spider without the normal benefit of gravity.

Man in Space - Apollo, Skylab, Others.. (cont'd)

NASA EP-109 (1977) Apollo-Soyuz, 132p., $3.30.
Abs.: The full story of the historic Apollo-Soyuz Test Project in which American astronauts and Soviet cosmonauts joined their spacecraft and conducted scientific experiments. ASTP was the first international manned space mission.

NASA EP-107 (1973) Skylab: A Guidebook, 256p., $2.20.
Abs.: Detailed description of the Skylab program, missions and equipment. Prepared by scientists and engineers that worked on the project.

NASA EP-106 (1971) Information for Teachers/Skylab Student Project, 44p., $1.00.
Abs.: Brief description of the Skylab Program and the NSTA-NASA Skylab Student Project, including experiment selection for flight, experiment performance and summaries of each of the 25 national winning student experiments. Includes related classroom activities.

*NASA EP-100 (1974) Apollo, 63p., $2.65.
Abs.: Commemorative book summarizes the historic manned lunar landing program and features in color, some of the best photographs from each Apollo mission.

NASA EP-96 (1979) Space Shuttle, 8p., $.70.
Abs.: A picture book that illustrates the spacecraft and its mission in full color paintings by Robert McCall. The economy and versatility of the Space Shuttle Program are clearly shown.

NASA SP-404 (1979) Skylab's Astronomy and Space Sciences, 130p., $9.00.
Abs.: Summarizes the results of the space science and astronomy experiments conducted on Skylab. Principal chapters are "Stellar and Galactic Astronomy," "Interplanetary Dust," "Observations of Comet Kohoutek," "Energetic Particles," "The Earth's Atmosphere," and "The Orbital Environment."

NASA SP-407 (1976) Space Shuttle, 97p., NTIS $3.00, GPO $3.40.
Abs.: The Space Shuttle flight system and mission profile are briefly described. Emphasis is placed on the economic and social benefits of the space transportation system. The Space Shuttle vehicle is described in detail.

NASA SP-412 (1977) Apollo-Soyuz Test Project, v1: Astronomy, Earth Atmosphere and Gravity Field, Life Sciences, and Materials Processing, 2 Volumes, 570p.
Abs.: The joint U.S.-U.S.S.R. experiments and the U.S. conducted unilateral experiments performed during the Apollo-Soyuz Test Project are described. Scientific concepts and experiment design and operation are discussed along with scientific results of postflight analysis.

Man in Space - Apollo, Skylab, Others.. (cont'd)

NASA SP-423 (1976) Space Resources and Space Settlements, 288p., $6.50.
Abs.: Contains technical papers from the 1977 Ames Summer Study on Space Settlements and Industrialization Using Nonterrestrial Materials. This summer study was the largest and most comprehensive investigation of space habitation to date. Papers by five task groups cover the following general topics: Regenerative life support systems, habitat design, dynamics and design of electromagnetic mass drivers, asteroids as resources for space manufacturing and processing of nonterrestrial materials.

Smith, L. (Edit.) (1969) We Came in Peace, Classic Press, San Rafael, CA, 77p.

Summerlin, L. B. (Edit.) (1976) Skylab, Classroom in Space, NASA SP-401, 190p.
Abs.: The results of Skylab experiments that were proposed by talented high school students through the Skylab student project which was administered by the National Science Teachers' Association are presented. The experiments and demonstrations covered a broad range of the physical and biological sciences.

*Wilford, J. N. (1969) We Reach the Moon: The New York Times Story of Man's Greatest Adventure, Bantam, New York, $1.25.
Abs.: A detailed and readable account of the history of the Apollo program and the landing of Apollo 11.

SOLAR SYSTEM - (Origin, History, Planetology); Reviews & General Textbooks:

Alfven, H., and G. Arrhenius (1976) Evolution of the Solar System, NASA SP-345, 599p., $11.00.
Abs.: Presents the physics and chemistry involved in analyzing the origin and evolution of the solar system.

Burns, J. A. (Edit.) (1977) Planetary Satellites, U. Arizona Press, Tucson, AZ, 598p.
Abs.: This book contains 27 papers on orbital theory, origins, available data, and observations of the physical properties of the solar system's 30-plus moons as we understood them before the Voyager encounters with Jupiter's moons.

*Chapman, C. R. (1977) The Inner Planets, Charles Scribner's Sons, 170p. $7.95.
Abs.: An entertaining book that describes the process of learning about our own Earth by studying the rocky, alien worlds of the solar system: Mercury, Venus, the Moon, Mars, and the Asteroids. The book is not a detailed guide to the planets, but it captures much of the excitement of how scientists go about studying other worlds.

*Davies, M. E., and B. C. Murray (1971) The View from Space: Photographic Exploration of the Planets, Columbia U. Press, New York, 163p.

Dollfus, A. (Edit.) (1970) Surfaces and Interiors of Planets and Satellites, Academic Press, London.

Gehrels, T. (Edit.) (1978) Protostars and Planets: Studies of Star Formation and of the Origin of the Solar System, U. Arizona Press, Tucson, AZ, 756p., $17.50.
Abs.: This book is the Proceedings of a conference that studied the ways in which interstellar dust can come together to form dust clouds, stars, planets, and solar systems. Its 39 technical papers cover the following topics: reviews, present nature of interstellar dust, dust clouds, supernovae and isotopes, meteorite data, proto-planets and planetesimals, cores and stellar winds.

Solar System (Origin, History, Planetology)... (cont'd)

Gehrels, T. (Edit.) (1974) Planets, Stars, and Nebulae: Studies with Polarimetry, U. Arizona Press, Tucson, AZ, 1133p.
Abs.: A Technical symposium consisting of 75 papers on the use of polarized light to study astronomical objects, from dust to galaxies. Contains detailed information on techniques, solid surfaces and satellites, stars and nebulae. Describes the unique information obtained from these diverse objects: chemical composition, physical state, electrical and magnetic fields.

Greeley, R. and M. H. Carr (1976) A Geological Basis for the Exploration of the Planets, NASA SP-417.

Green, J. and N. M. Short (Edit.) (1971) Volcanic Landforms and Surface Features, Springer-Verlag, New York, 519p.

Hartmann, W. K. (1972) Moons and Planets: An Introduction to Planetary Science, Bogen and Quigley Inc., Tarrytown-on-Hudson, New York, 404p.

Henderson, A., Jr., and J. Grey (Edit.) (1974) Exploration of the Solar System, NASA EP-122, 72p., $2.05.
Abs.: Discusses the purpose of solar system exploration, advances in knowledge made possible by spacecraft, the spacecraft themselves, launch vehicles, and other technology involved in solar system exploration and a program for the future.

Kaufmann, W. J., III (1978) Exploration of the Solar System, Macmillan Pub. Co., New York, 575p.
Abs.: A well-written introductory textbook for serious students. It includes brief review chapters on the history of astronomy and the nature of stars and galaxies, but it emphasizes the solar system and our exploration of it by spacecraft and telescope. Separate sections describe in detail the Sun, the planets (including our own dynamic Earth), and the "vagabonds"—asteroids, comets and meteorites. Useful as a textbook for a college-level introductory course in planetary science, or as a sourcebook for data about planets, spacecraft, and space exploration. Should be approached with some background in physics and chemistry.

*Kaufmann, W. J., III (1979) Planets and Moons, W. H. Freeman and Co., San Francisco, CA, 219p.
Abs.: A simple, well-written introduction to the solar system and its planetary residents. Aimed at non-scientists, this book covers theories of the solar system's origin, it describes each planet as it has been seen by spacecraft and earth-based telescopes. A good summary of meteorites and comets is included. Historical information is combined with the latest (through 1978) data and pictures. A chapter on our newly-understood dynamic Earth highlights the variety of worlds in the solar system and provides good discussions of why planets are different. An excellent book for a beginning student, teacher, or general reader with a minimum of science background. It will also make enjoyable reading for scientists interested in reviewing the latest discoveries about the solar system.

Solar System (Origin, History, Planetology)...(cont'd)

King, E.A. (1976) Space Geology, J. Wiley, New York.

McCall, G.J.H. (Edit.) Meteorite Craters, Dowden, Hutchinson and Ross Inc., Stroudsburg, Penn., (Benchmark Publications in Geology, v. 36), 364p.

Middlehurst, B.M., and G.P. Kuiper (Edit.) (1963) The Moon, Meteorites and Comets, U. Chicago Press, 810p.

NASA EP-117 (1975) New Horizons, 40p., $2.00.
Abs.: This overview of on-going NASA programs in the post-Apollo period calls attention to the shifts of emphasis in aeronautical research and space exploration. NASA's contributions to the solution of pressing national problems share the spotlight. Topics cover energy, weather, communications, oceanography, medicine, mineral prospecting, Viking, Mariner, Pioneer and other flight projects.

NASA EP-82 (1971) Planetary Exploration, 28p., $.95.
Abs.: The strategy for planetary exploration embraces orbiting of Mars, landing on Mars, exploration of Jupiter and the outer planets and missions to Mercury and Venus.

Pomeroy, J.H., and N.J. Hubbard (Edit.) (1977) The Soviet-American Conference on the Cosmo-Chemistry of the Moon and Planets, NASA SP-370, 2 vols., 929p., $18.00 for set.

Powers, R.M. (1978) Planetary Encounters: The Future of Unmanned Spaceflight, Stackpole Books, Harrisburg, Pa., 288p., $13.95.

Roddy, D.J., R.O. Pepin, and R.B. Merrill (Edit.) (1977) Impact and Explosion Cratering: Planetary and Terrestrial Implications, Proceedings of the Symposium on Planetary Cratering Mechanics 1976, Pergamon Press, New York, 1301p.

*Ryan, P., and L. Pesek (1978) Solar System, Viking Press, New York, 224p. $25.00, (pictorial and text).

Solar System (Origin, History, Planetology)...(cont'd)

*Scientific American (Sept. 1975) The Solar System, v. 233, No. 3, 208p., $1.50.
Abs: Twelve articles reviewing our knowledge of the sun, planets, satellites, asteroids, interplanetary particles and fields, and origin and evolution of the solar system as of 1975.

Short, N.M. (1975) Planetary Geology, Prentice-Hall, Englewood Cliffs, New Jersey, 361p., $17.95.
Abs.: A textbook that summarizes the application of terrestrial geology to lunar studies, the scientific results from the Apollo program, and the new knowledge obtained by unmanned spacecraft about other planets.

Urey, H.C. (1952) The Planets, Their Origin and Development, Yale U. Press, New Haven, Conn.

Von Braun, W., and F.I. Ordway (1979) New Worlds: Discoveries from our Solar System, Doubleday, Garden City, New York, 284p., $24.95.

*Wood, J.A. (1979) The Solar System, Prentice-Hall, Englewood Cliffs, New Jersey, 196p.

SUN

Athay, R. G., (1976) The Solar Chromosphere and Corona: The Quiet Sun, D. Reidel, Dordrecht, Holland, 504p. $59.00.
Abs.: A detailed study of the structures, dynamics, magnetic fields and energy balance of the solar photosphere, chromosphere and corona, including summaries of observational data which apply to these problems.

*Chapman, Robert D. (1978) The Sun and Us - A Look at the Solar Terrestrial Program, NASA Report to Educators, Vol. 5, No. 4.

Eddy, J. A. (Edit.) (1978) The New Solar Physics, Westview Press, Boulder, CO, 214p., $18.50.
Abs.: Contains reviews given at an AAAS Symposium in February 1977, covering four of the most rapidly advancing, and most controversial areas of solar physics. Chapters are by John Eddy on historical evidence for changes in the solar output, Raymond Davis, Jr., and John Evans Jr., on the continuing problem of the "missing solar neutrinos, Arthur Hundhausen on streams and sectors in the solar wind and their connection with solar magnetism, and Henry Hill on the field of solar seismology.

*Eddy, J.A., and R. Ise (Edit.) (1979) A New Sun: The Solar Results from Skylab, NASA SP-402, 220p., $10.50.
Abs.: Contains the scientific results and many of the color photographs of the Sun taken during the Skylab mission with the cameras of the Apollo Telescope Mount installed in the space station. ATM observations have led to many new discoveries about the nature of the Sun and the fascinating events that occur on its surface.

Gibson, E. G., (1973) The Quiet Sun, NASA SP-303, Washington, D.C., 330p., $6.20.
Abs.: A textbook, written by one of the Skylab astronauts, which presents the observational and theoretical basis for our understanding of the solar interior, the solar surface, and the solar corona in their quiet, undisturbed phases.

Sun...(cont'd)

Herman, J.R., and R.A. Goldberg (1979) Sun, Weather and Climate, NASA SP-426, 372p., $4.50.
Abs.: A study of the literature of sun/weather/climate relationships by two scientists who state the possibility that fluctuations in the energy output of the Sun may affect Earth's climate and weather. They believe that such an effect could prove beneficial if the linking mechanisms can be understood. This book addresses scientific questions that may lead to an understanding of the linking mechanisms between solar activity and climatological and meteorological responses. Such an understanding, say the authors, may make possible improvements in prediction of weather and climate, which in turn could contribute to the solution of related social problems.

Meadows, A. J., (1970) Early Solar Physics, Pergamon, London, 280p., $14.50.
Abs.: A history of ideas about the nature of the sun, spanning the time from the early speculations of Galileo and Herschel to the rise of spectroscopy and astrophysics in the nineteenth century, to the detailed understanding of the twentieth century.

*Meadows, A. J., (1972) Science and Controversy, A Biography of Sir Norman Lockyer, The MIT Press, Cambridge, MA.

*NASA EP-119 (1973) Skylab and the Sun, 56p., $1.10.
Abs.: Leading scientists and experts on solar physics are contributors to this highly readable book describing the Sun, the Skylab space station solar experiments and what mankind stands to gain from the Skylab experience.

*NASA EP-118 (1974) Our Prodigal Sun, 12p., $.35.
Abs.: The dynamic Sun, its characteristics observed and measured by spacecraft, is proving more complex and fascinating than ever, especially for a world anxious to use its energy.

*NASA S 22-132, (1978) Solar Polar: Mission to the Sun, 12p.

Sun...(cont'd)

NASA SP-366 (1975) Possible Relationships Between Solar Activity and Meteorological Phenomena, 261p., $4.00.
Abs.: A collection of papers resulting from a symposium on this subject held at the NASA Goddard Space Flight Center in November, 1973.

Svestka, Z., (1976) Solar Flares, D. Reidel, Dordrecht, Holland, 399p.
Abs.: A lucid and complete description of the observational data on solar flares and the theoretical models which have been proposed to explain these data sets.

White, O. R. (Edit.) (1977), The Solar Output and Its Variation, Colorado Associated University Press, Boulder, CO, 526p.
Abs.: Contains the proceedings of a workshop on the solar output held in April, 1976. Papers cover measurements of the solar flux over the entire spectrum and variability of this flux, particle outputs from the sun and variations in these outputs and theories of solar variability.

*Wright, H. (1966) Explorer of the Universe: A Biography of George Ellery Hale, E. P. Dutton and Co. Inc., New York, NY, 480p.

Zirker, J. B. (Edit.) (1977) Coronal Holes and High Speed Wind Streams, Colorado Associated University Press, Boulder, CO, 454p.
Abs.: A detailed account of the discoveries by Skylab about coronal holes, their importance in the overall structure of the sun's magnetic field and their association with high speed streams in the solar wind.

MERCURY

Davies, M.E., S.E. Dwornik, D.E. Gault, and R.G. Strom (Edit.) (1978) Atlas of Mercury - Mariner 10 Mission, NASA SP-423, 128p.
Abs.: The Mariner 10 spacecraft, its scientific mission, surface mapping techniques are described as well as the topographic features of the planet Mercury photographed by television cameras during three flyby encounters. Shaded relief maps and a computer generated photomosaic of 9 of the 15 cartographic regions are presented. Subsequent material in the atlas includes enlargements of portions of mosaics of small areas, and stereo pairs located within the boundaries of the cartographic regions. Footprint locations of individual pictures and stereo pairs are plotted on the shaded relief maps. Current values of the more important orbital and physical properties of Mercury are presented in tables.

Dunne, J.A., and E. Burgess (1978) The Voyage of Mariner 10: Missions to Venus and Mercury, NASA SP-424, 233p., $12.25.
Abs.: The historical details of the Mariner 10 mission are recorded. Provided is a selection of some of the images obtained by the spacecraft at both Venus and Mercury. The solar sailing method greatly reduced the spacecraft's gas usage thus permitting two returns to Mercury. These revisits provided additional pictures of the planet's south pole and confirmed the existence of Mercury's magnetic field.

Murray, B., and E. Burgess (1977) Flight to Mercury, Columbia U. Press, New York, 162p., $12.95.

VENUS

Jastrow, R., and S.I. Rasool (Edit.) (1969) The Venus Atmosphere, Gordon and Breach, New York, 604p.

NASA-SP-382 (1974) The Atmosphere of Venus, 198p.

(See MERCURY for references to exploration of Venus by the Mariner 10 mission.)

EARTH (from space)

*Darden, L. (1974) The Earth in the Looking Glass, Doubleday Anchor Press, N.Y., 324p., $7.95.
Abs.: A readable description of the first satellite program developed and flown specifically for studying the Earth. Discussion of important results from the LANDSAT (land-satellite) program: geology, agriculture, environmental study and management.

Freden, S.C., E.P. Mercanti, and M.A. Becker (Edit.) (1973) Symposium on Significant Results Obtained from the ERTS-1: v1: Technical presentations, Sections A & B, NASA SP-327, 1686p., $13.65.
Abs.: The proceedings of a conference on the significant results obtained by remote sensors mounted in the ERTS-1 (now Landsat-1) satellite are presented. The subjects discussed include the following: (1) agriculture, forestry and range resources, (2) mineral resources, (3) geological structures and landform surveys, (4) environmental surveys, (5) water resources, (6) land use and mapping, (7) development of interpretation techniques, (8) marine resources and ocean surveys, and (9) regional resource surveys.

Lowman, P.D., Jr. (1972) The Third Planet, Verlag Reinhold A. Muller, Zurich, Switzerland, 170p.
Abs.: A beautifully illustrated book of photographs of the Earth taken by the astronauts on the Gemini and Apollo missions. The photographs are combined with an excellent text that describes how space pictures have helped us learn more about the geology, weather, oceans, and unexplored lands of our own world. The book is a stunning demonstration of how going into space has given us a new perspective on our home planet.

Kroeck, D. (1976) Everyone's Space Handbook: A Photograph Imagery Source Manual (ERTS Images), Pilot Rock Inc., Arcata, California, 175p.

Earth (from space)...(cont'd)

NASA EP-103 (1977) What's the Use of Land?, 64p., $1.45.
Abs.: This secondary school social studies project booklet integrates NASA space observations of Earth with environmental education and other social studies. It can serve as a social studies teacher's guide for interdisciplinary instruction and school-community involvement.

NASA SP-380 (1977) Skylab Explores the Earth, 531p., $17.50.
Abs.: The quality and the quantity of photographic and observational data that could be acquired by the crew of the many types of earth features when supported by multidisciplinary scientific training before lift-off, by real-time science mission planning, and by a comprehensive onboard set of procedures, maps, and photographs are evaluated. The visual observations experiment aimed at the following: (1) determine the types of surface, air, and water phenomena the crew could visually identify from the Skylab orbit, (2) determine what visual observations, supported by photography, could be accomplished to support scientific investigations, (3) explore the use of several data parameters in the study of multidisciplinary areas; and (4) determine the type of crew training necessary to perform the visual observations desired by scientists.

NASA SP-171 (1968) Earth Photographs from Gemini 6 through 12 335p., $8.00.
Abs.: Color photographs of earth surface taken during Gemini flights 6 through 12.

NASA SP-404 (1979) Skylab's Astronomy and Space Sciences, 130p., $9.00.
See under Man in Space for abstract.

Nicks, O.W. (Edit.) (1970) This Island Earth (photographs), NASA SP-250, 192p., $6.00.
Abs.: An early collection of color pictures of our own world as seen through the eyes of the first orbiting astronauts. The text and photograph captions provide details about one of the most exciting discoveries of the space program--a new vantage point from which to explore and understand our own planet.

Earth (from space)...(cont'd)

Pierson, W.J. (Edit.) (1978) Skylab EREP Investigation Summary, NASA SP-399, 387p.
Abs.: The problems in the areas of agriculture, range and forestry; land use and cartography; geology and hydrology; oceans' atmosphere, and data analysis techniques were investigated and summarized using Earth Resources Experiment Package (EREP) data.

*Short, N.M., P.D. Lowman, Jr., S.C. Freden, and W.A. Finch, Jr. (1976) Mission to Earth: LANDSAT views the world, color imagery of the Earth's surface, NASA SP-360, 926p., $14.00.
Abs.: A stunning collection of panoramas of the Earth as viewed by the automated LANDSAT (formerly ERTS) spacecraft, this book presents the results of the exploration of our own planet from space. The photographs display the beauty of the Earth's surface and also illustrate specific examples of how the view from space is providing us with better information about agriculture, mineral resources, and the spread of our own civilization across the Earth.

Williams, R.S., and W.D. Carter (Edit.) (1976) ERTS-1 A New Window on our Planet, Geological Survey Prof. PP. 929, 362p

MOON

Baldwin, R.B. (1963) The Measure of the Moon, U. Chicago Press, Chicago, 488p., $13.50.
Abs.: The standard textbook on the nature, history and origin of the Moon as it was known before the Apollo program.

*Barbour, J. (Edit.) (1969) Footsteps on the Moon, Associated Press, 214p., $7.95.
Abs.: A pictorial history of the lunar program and the landing of Apollo 11.

Bowker, D.E., and J.K. Hughes (1971) Lunar Orbiter Photographic Atlas of the Moon, NASA SP-206, 41p., 675 plates, $19.25.

*Cooper, H.S.F. (1970) Moon Rocks, Dial, New York, 197p., $5.95.
Abs.: A journalist's record of the arrival of the Apollo 11 lunar samples and of the first scientific results obtained from them. A very interesting and readable presentation of both scientific information and personalities.

*French, B.M. (1976) What's New on the Moon, NASA EP-131, 24p., $.70.
Abs.: A concise and entertaining summary of what we have learned about the Moon by landing astronauts on it and by bringing back moon rocks to study here on Earth. Written for the non-scientist, this well-illustrated booklet tells what the Moon is made of, how old it is, what its history has been, and how we are using it as a "space probe" to determine the histories of the Sun and the stars.

*French, B.M. (1977) The Moon Book, Penguin Books, 287p., $4.95.
Abs.: Written for the general reader, this book describes in non-technical language the history of lunar exploration, the discoveries of the Apollo Program, our present picture of the Moon, and the Moon's importance to our future exploration of the solar system. The book is a readable summary of lunar science and its implications for understanding the early history of the Earth and the origin of the universe itself.

Moon...(cont'd)

Frondel, J. (1975) Lunar Mineralogy, Wiley (Interscience), 323p., $18.95.
Abs.: This textbook summarizes the results of scientific studies of the minerals found in lunar samples. It contains detailed descriptions of all lunar minerals, together with summaries of information about their chemistry and properties.

Guest, J.E., and R. Greeley (1977) Geology on the Moon, Wykeham Publications Ltd, London, 235p.

Kosofsky, L.J., and El-Baz, F. (1970) The Moon as viewed by Lunar Orbiter, NASA SP-200, 156p., $7.75.
Abs.: Selected compilation of Lunar Orbiter photographs showing salient features of lunar surface.

*Langseth, M., and L. Langseth (1973) Apollo Moon Rocks, Coward, McCann and Geoghean, New York, 60p., $4.64.
Abs.: A brief, well-illustrated and simple description of the moon and moon rocks for readers from third through sixth grades.

Lindsay, J.F. (1976) Lunar Stratigraphy and Sedimentation, Elsevier Scientific Publishing Co., New York, 302p.

Lowman, P.D. (1969) Lunar Panorama: A Photographic Guide to the Geology of the Moon, Weltflugbild Reinhold A. Muller, Zurich, Switzerland, 133p., $12.50.
Abs.: A beautifully illustrated collection of Lunar Orbiter photographs of the lunar surface, with a detailed discussion of lunar geology and descriptions of lunar surface features.

Mason, B., and W.G. Melson (1970) The Lunar Rocks, Wiley Interscience, J. Wiley, New York, 179p., $11.00.
Abs.: A brief technical description of the first lunar samples returned by the Apollo 11 mission, including their chemistry and mineralogy and their implications for the origin and history of the Moon.

Moon...(cont'd)

Masursky, H., G.W. Colton, and F. El-Baz (Edit.) (1978) Apollo over the Moon: A view from orbit, NASA SP-362, 263p., $9.25.
Abs.: The Apollo metric camera system was flown to acquire photographic data with accuracy to aid the effort of moon mapping. The panoramic camera was selected to provide high resolution photography of lunar surface features for detailed analysis and photointerpretation. A portion of these photographs is presented. Various views and subjects include the following: (1) Regional views; (2) The Terrae; (3) The Maria; (4) Craters; (5) Sinuous and Straight Rilles; and (6) Unusual features.

Mutch, T.A. (1973) Geology of the Moon, 2nd Ed., Princeton U. Press, Princeton, N.J.

Mutch, T.A. (1970) Geology of the Moon: a Stratigraphic View, Princeton U. Press, Princeton, N.J., 325p., $17.50.
Abs.: A detailed presentation of how geological methods were applied to understand the origin and history of the moon before the Apollo landings.

Royal Society of London, The (1977) The Moon - A New Appraisal from Space Missions and Laboratory Analyses, 605p.

Schultz, P.H. (1976) Moon Morphology: Interpretations based on Lunar Orbiter photography, U. Texas Press, Austin, 626p. (Mostly photographs)

*Shuttlesworth, D.E., and L.A. Williams (1977) The Moon: Steppingstone to Outer Space, Doubleday & Co., Inc., 117p., $5.95.
Abs.: Especially suitable for young readers, this book is a readable and well-illustrated guide to current information about the Moon. It presents in simple language the history of lunar studies, the Apollo missions and their discoveries, and the future value of the Moon in exploring space.

Taylor, G.J. (1980), A Close Look at the Moon, Dodd, Mead, and Co., New York, 95p, $5.95.
Abs.: An entertaining readable, and beautifully illustrated guide to the Moon for young readers (ages about 12-15). Written in a clear, simple style by a

Moon...(cont'd)

scientist who has actually studied moon rocks and meteorites, this book describes the excitement of our missions to the Moon and tells what we found there. Simple descriptions of the different kinds of moon rocks are combined with information about how scientists study them and what they tell us. The book also covers other topics about our nearest neighbor world--the nature of the Moon's hidden interior, the slow changing of its surface by meteorite bombardment, and the things the Moon has told us about our own Earth.

Taylor, S.R. (1975) Lunar Science: A Post Apollo View, Pergamon Press, New York, 372p., $9.50.
Abs.: An extensive textbook that describes in detail the scientific results from the Apollo program and the state of present knowledge about the nature, origin and history of the Moon.

*Zim, H. S. (1980) The New Moon, William Morrow and Co., (Morrow Junior Books), New York, NY (available Spring 1980).
Abs.: A simple well-written presentation of lunar science discoveries for young readers.

MARS

American Geophysical Union (1977) Scientific Results of the Viking Project, reprinted from the Journal of Geophysical Research, v.82, No.28, Sept. 30, 1977, pp. 3959-4681.

Avener, M.M., and R.D. MacElroy (1976) On the Habitability of Mars, NASA SP-414, 105p., $5.25.
Abs.: A long-range consideration of whether life can survive on Mars and of how we might bring life ... including ourselves ... to the planet to change its present environment into something more earthlike.

Blunck, J. (1977) Mars and its Satellites, Exposition Press, Hicksville, New York, 200p.

*Bradbury, R., A.C. Clarke, B. Murray, C. Sagan, and W. Sullivan (1973) Mars and the Mind of Man, Harper and Row, N.Y., 143p., $7.95.
Abs.: A collection of essays about Mars, in which five scientists and writers discuss their feelings about Mars and what might be found there as Mariner 9 went into orbit around the planet in 1971. The book also presents some later reactions of the same people to the discoveries made by the spacecraft.

*Burgess, E. (1978) To the Red Planet, Columbia U. Press, New York, 181p., $19.95.

*Carr, M. (1976) "The Volcanoes of Mars," Scientific American, v.234, No.1, January, 1976, pp. 32-43.
Abs.: A detailed discussion of the huge volcanoes discovered on Mars in 1971 by the Mariner 9 spacecraft, their size and appearance, their differences from terrestrial volcanoes, their ages, and what they tell about the history and internal structure of Mars.

Collins, S.A., Jr. (1971) The Mariner 6 and 7 Pictures of Mars, NASA SP-263, 168p., $4.25.
Abs.: A comprehensive set of high quality reproductions of the final, computer-processed television pictures of Mars is presented. The genesis and unique characteristics of the pictures are explained, interesting features are pointed out, and some indication of their significance in the history of Mars investigations is provided.

Mars... (cont'd)

Corliss, W.R. (1975) The Viking Mission to Mars, NASA SP-334, 77p., $1.80.
Abs.: This monograph describes the plans for NASA's Viking spacecraft to explore the planet that most nearly resembles the earth and the search for life on the surface of Mars.

*French, B.M. (1977) Mars: The Viking Discoveries, NASA EP-146, 32p., $1.50.
Abs.: In 1976 two Viking spacecraft landed on the surface of Mars to explore the mysterious Red Planet and to search for life. This beautifully illustrated booklet tells in nontechnical language what the Viking found--exciting new discoveries about the chemistry, the weather, the history, and (perhaps) the life of Mars.

Glasstone, S. (1968) The Book of Mars, NASA SP-179, 315p, $5.25.
Abs.: A thorough compilation, now somewhat dated, of our knowledge about Mars in the pre-Mariner and pre-Viking years. Still a useful source of information about the general characteristics of Mars and the history of study of the planet.

Hartmann, W.H., and O. Raper (1974) The New Mars: the Discoveries of Mariner 9, NASA SP-337, 179p., $8.75
Abs.: A beautifully-illustrated textbook that combines the early discoveries about Mars with the new scientific studies made with the Mariner 9 close-up pictures. Carefully selected illustrations highlight separate chapters that describe different features of Mars: meteorite craters, volcanoes, polar caps, clouds, sand dunes, and possible ancient rivers. Photographic comparison of similar features on Mars and the Earth show how the same processes of volcanism and wind can affect different planets.

Hoyt, W.G. (1976) Lowell and Mars, U. Arizona Press, Tucson, AZ, 376p.,HC: $13.95, $8.50.
Abs.: A detailed and scholarly biography of the astronomer Percival Lowell and his involvement in the controversy over the existence of intelligent life on Mars. For people interested in the history of astronomy and the study of Mars in the early 20th Century.

*Moore, P. (1977) Guide to Mars, W.W. Norton Co., New York, 214p., $9.95.

Mars...(cont'd)

Mutch, T.A., R.E. Arvidson, J.W. Head III, K.L Jones, and R.S. Saunders (1976) The Geology of Mars, Princeton U. Press, New Jersey, 400p., $35.00.
Abs.: A graduate-level textbook on the surface features, geological processes, and rock formations of Mars as determined from spacecraft observations. (There is a brief appendix containing early Viking results.) The book provides a detailed scientific summary of our current knowledge about Mars. It also provides good comparisons of how the same geological forces--volcanoes, wind, and water --operate in different ways on the Earth, Moon, and Mars.

NASA EP-90 (1971) Two Over Mars, 44p., $.90.
Abs.: The story of the Mariner Mars 1969 project in which Mariners 6 and 7 significantly added to knowledge of the red planet. Flight performance, scientific results and technical characteristics of the spacecraft are described and portrayed in text and pictures.

NASA SP-425 (1978) The Martian Landscape - Viking Mars Mission and Photographs, 160p., $12.00.
Abs.: A first person, anecdotal account of preparations for photographing the Martian surface is related by the leader of NASA's Lander Imaging Science Team. Particular attention is given to the design of the facsimile camera. Image sequencing, picture calibration, reconstruction of color, and the search for motion on Mars are discussed. Over 200 color and black and white photographs taken by both landers are included along with a table showing the camera settings used. A stereopticon is included for viewing 19 stereopairs in three dimension.

*NASA SP-329 (1974) Mars as viewed by Mariner 9, 279p., $8.15.
Abs.: A detailed "picture book" of Mars as seen through the cameras of Mariner 9, this document contains several hundred captioned illustrations of the craters, volcanoes, canyons, dunes, clouds, and ice caps that make Mars a complex and fascinating planet, partly like Earth and partly like the Moon.

*National Geographic (January, 1977) "Mars: Our First Close Look", v.151, No.1, pp. 2-31.
Abs.: Handsomely illustrated presentation of Viking results for the general reader. Scientific results are combined with beautiful color panoramas of the surface of Mars.

Mars...(cont'd)

Veverka, J. (1977) "Phobos and Deimos," Scientific American, v.236, No.2, February, 1977, pp. 30-37.
Abs.: A description of the two tiny moons of Mars, revealed in close-up photographs taken by the Mariner and Viking spacecraft. The moons may be captured asteroids. They give us an indication of what millions of other small bodies in the solar system may be like.

JUPITER (and other major planets)

Fimmel, R.O., W. Swindell, and E. Burgess (1977) Pioneer Odyssey, Encounter with a Giant, NASA SP-349, 229p., $9.85. Abs.: The story of the Pioneer 10 mission which sent an automated spacecraft far out into the solar system to swing around the giant planet Jupiter and then become the first man-made object to leave our solar system. This well-illustrated book also contains details of the close-up scientific discoveries made about Jupiter: its color bands, its historic Red Spot, its magnetic fields, and its mysterious radio noises.

Gehrels, T. (Edit.) (1976) Jupiter: Studies of the interior, atmosphere, magnetosphere and satellites, U. Arizona Press, Tuscon, 1254p.

NASA-JPL 400-11 (1979) Voyager 1, Encounter with Jupiter, 43p. Abs.: Best photographs by Voyager 1, in its passage of Jupiter.

NASA SP-420 (1977) Voyager to Jupiter and Saturn, 62p. Abs.: The NASA Voyager mission to explore planets of the outer solar system is summarized. The mission schedule and profiles for encounters with Jupiter and Saturn, and possibly with Uranus and Pluto are included along with a description of the spacecraft and its trajectories. Scientific investigations to be made and the instruments carried are also discussed.

Peek, B.M. (1958) The Planet Jupiter, Faber and Faber, London.

Ponnamperuma, C. (Edit.) (1976) Chemical Evolution of the Giant Planets, Academic Press, New York, 240p.

SATURN

NASA Conference Publication 2068 (1978) The Saturn System. Abs.: A collection of papers resulting from a workshop to discuss a possible orbiter and entry probe mission to Saturn held at the Reston International Conference Center, February 9-11, 1978. Fifteen papers reviewed the current (at that time) state of knowledge of Saturn and its satellites at a fairly technical level. Four papers reviewed what we hope to learn about the Saturn system from Voyager. Eight papers discuss future exploration of the outer planets.

NASA SP-340 (1973) The Atmosphere of Titan, 177p.

Palluconi, F.D., and G.H. Pettengill (Edit.) (1974) The Rings of Saturn, NASA-SP-343, 222p.

(See also under JUPITER for general and comparative studies).

URANUS, NEPTUNE and PLUTO

(See ASTRONOMY AND SPACE SCIENCES; SOLAR SYSTEM; JUPITER for general information. All our information comes from earth-based observations, and it is seriously lacking in details.)

ASTEROIDS, METEORITES, TEKTITES, AND COSMIC DUST

Barnes, V.E., and M.A. Barnes (Edit.) (1973) Tektites, Dowden, Hutchinson, and Ross, Inc., Stroudsburg, PA, 445p.
Abs.: An annotated collection of 46 technical papers that span 40 years of research on tektites, the strange glassy materials that may be of extraterrestrial origin. Assembled and discussed by two experts in the field, the papers provide source data on the nature, properties, and chemical compositions of tektites, on their geographic distribution and relations to known meteorite impact craters, and on their origins. Includes papers dealing with newly-discovered deep-sea microtektites and with comparisons between tektites and lunar rocks. A convenient reference for the interested scientist.

Buchwald, V.F. (1975) Handbook of Iron Meteorites, v. 1-3, U. of California Press, Berkeley.

Gehrels, T. (Edit.) (1979) Asteroids, University of Arizona Press, Tucson, AZ, 1181p.
Abs.: A collection of 45 papers by scientists active in asteroid or meteorite research, this volume is intended to be a graduate-level textbook. Topics covered include the history of asteroid studies, dynamical properties, optical properties, composition as inferred by remote sensing, relationship to meteorites and comets, theories of origin, and future exploration, among others.

Gehrels, T. (1971) Physical Studies of Minor Planets, NASA SP-267, 287p.

*Heide, F. (1964) (Translation) Meteorites, U. Chicago Press, $1.95.
Abs.: An introductory textbook for non-specialists that covers the basic information about meteorites: their nature, chemistry, mineral composition, history, how they are used as probes to detect cosmic rays, and the craters they make when they fall to earth. A good book for the general reader.

Asteroids, Meteorites, Tektites, etc.,...(cont'd)

Krinov, E.L. (1966) (Translation) Giant Meteorites, Pergamon Press, New York, 397p., $20.00.
Abs.: A detailed textbook, written by a prominent Russian authority, which describes both ancient terrestrial meteorite craters and modern falls of large meteorites. The book is an excellent source of information about little-known Russian meteorite falls, and the section describing the investigation of the 1908 Siberian explosion is a fascinating adventure story in itself.

Mason, B. (Edit.) (1971) Handbook of Elemental Abundances in Meteorites, Gordon and Breach, New York, 555p., HC $50.50, $20.10.
Abs.: A complete summary of the chemical data obtained from the study of all the different types of meteorites.

*Mason, B. (1962) Meteorites, J. Wiley, New York, 274p., $8.95
Abs.: A basic textbook on the minerals and chemistry of meteorites, suitable for more advanced readers, but considerably dated by the flood of meteorite research since it was published.

McDonnell, J.A.M. (Edit.) (1978) Cosmic Dust, John Wiley and Sons, N.Y..
Abs.: Spaceflight, lunar samples, and better analytical instruments: all these have combined to produce a renewed interest in the fine material that fills up the rest of the solar system. This collection of technical articles from a recent conference covers the current state of information about the amount, nature, significance, and future study of cosmic dust.

McCall, G.J.H. (1973) Meteorites and their Origins, Halsted Press, J. Wiley, New York, 352p.

Millman, P.M. (Edit.) (1969) Meteorite Research, Springer-Verlag, New York.

Morrison, D., and W.C. Wells (Edit.) (1978) Asteroids: An Exploration Assessment, NASA CP-2053, 300p.

Asteroids, Meteorites, Tektites, etc.,...(cont'd)

Nagy, B. (1975) Carbonaceous Meteorites. Elsevier, New York, 747p., $80.95.
Abs.: A complete encyclopedia on the history, nature, minerals, chemistry, and organic compounds of the unusual carbon-bearing meteorites which are our best samples of primordial solar system material and which contain important clues to the origin of life.

NASA SP-404 (1979) Skylab's Astronomy and Space Sciences, 130p., $9.00.
See under Man in Space for abstract.

*Nininger, H.H. (1971) Find a Falling Star, Paul S. Erikson Inc., 254p., $8.95.
Abs.: A fascinating autobiography of a "meteorite hunter" whose research career began when meteorites were only curiosities and continues into the present time when they have become the objects of intense and important scientific studies to decipher the nature and origin of our solar system.

Nininger, H.H. (1956) Arizona's Meteorite Crater: Past, Present and Future, World Press, Denver, 232p., $3.75.
Abs.: A detailed description of the world's best-known and most-visited meteorite crater, its history, and the information that it has yielded about meteorites and their collisions with the earth.

*Nininger, H.H. (1952) Out of the Sky: An Introduction to Meteorites, Dover Books, New York, 336p., $1.85.
Abs.: One of the first textbooks on meteorites, and still an excellent introduction to all facets of meteorite research, including the chemistry and mineralogy of meteorites, the search for ancient and modern fallen meteorites, and the nature of meteorite impact craters on the Earth.

O'Keefe, J.A. (1976) Tektites and Their Origin, Elsevier Scientific Publishing Co., New York, 254p.
Abs.: A detailed review textbook on tektites, those much-studied and much-debated glassy objects of possible extraterrestrial origin. The book includes a detailed summary of current scientific knowledge of tektites: their

Asteroids, Meteorites, Tektites, etc.,...(cont'd)

history, geographic distribution, shapes and surface markings, internal structures, physical properties, chemical composition, and nuclear and isotopic characteristics. The book contains arguments against the terrestrial origin favored by many scientists and presents evidence for a possible origin of tektites as the result of volcanic activity on the Moon.

Wasson, J.T. (1974) Meteorites, Springer Verlag, New York, 316p., $31.20.
Abs.: A thorough and up-to-date textbook covering all aspects of meteorite research: mineralogy, chemistry, ages, origin, and the role of meteorites in understanding the origin and present nature of the solar system.

Watson, F.S. (1962) Between the Planets, Doubleday, New York, 224p., $1.25.
Abs.: A well-written and well-illustrated general survey of the "leftover" material in the solar system: the asteriods, comets, and meteorites. The book provides a good description of the relationships of meteorites to other small bodies of the solar system.

Weinberg, J.L. (Edit.) (1967) The Zodiacal Light and the Interplanetary Medium (A Symposium, Jan. 30-Feb. 2, 1967), NASA SP-150.

Wood, J.A. (1968) Meteorites and the Origin of Planets, McGraw-Hill, New York, 117p., $2.95.
Abs.: A good introductory textbook about meteorites that covers current research and describes what meteorites tell us about the nature, age, and origin of the solar system.

COMETS

Delsemme, A.H. (Edit.) (1977) Comets, Asteroids, Meteorites: Interrelations, Evolution, and Origins, U. Toledo, Toledo, OH, (Univ. Bookstore) $36.50.
Abs.: This book contains 74 technical papers about the small bodies in the solar system, their relations to each other, and what they tell us about the origin of the solar system. Includes up-to-date information on nature of comets, comet orbits, meteors, nature of asteroids, orbits of asteroids, primitive meteorites, differentiated meteorites, origin of comets, the primitive solar nebula, and conclusions.

Donn, B., M. Mumma, W. Jackson, M. A'Hearn, and R. Harrington (1976) The Study of Comets, Parts 1 & 2, NASA SP-393, 1083p.

Gary, G.A. (1976) Comet Kohoutek--A Workshop, held at MSFC, June 13-14, 1974, NASA SP-355.

NASA SP-404 (1979) Skylab's Astronomy and Space Sciences, 130p., $9.00.
See under Man in Space for abstract.

Richardson, R.S. (1967) Getting Acquainted with Comets, McGraw-Hill, New York, 306p., $7.50.
Abs.: A well-written and readable description of the nature, origin, and history of comets and how scientists study them.

SPACE HABITATS AND NONTERRESTRIAL RESOURCES

Adams, J., and J. Billingham (1969) Moonlab- A Design for a Semi-Permanent Lunar Base, NASA-Ames, NASA TM-X-66429, 22p., $1.50.

Bova, B. (1974) Workshop in Space, E.P. Dutton & Co., New York, 67p.

Brand, S. (Edit.) (1977) Space Colonies, Penguin Books, 160p., $5.00.
Abs.: A collection of miscellaneous essays, debates, and letters on various aspects of space colonies and extraterrestrial life. Most useful in presenting the philosophy and mystique of the space colony concept to readers already familiar with the idea. (For readers not yet introduced to space colonies, O'Neill's The High Frontier and Heppenheimer's Colonies in Space are better books to start with.)

Criswell, D.R. (Edit.) (1976) Utilization of lunar materials and expertise for large scale operations in space: Abstracts--lunar bases and space industrialization , NASA CR-156167, 198p.
Abs.: The practicality of exploiting the moon, not only as a source of materials for large habitable structures at Lagrangian points, but also as a base for colonization is discussed in abstracts of papers presented at a special session on lunar utilization. Questions and answers which followed each presentation are included after the appropriate abstract. Author and subject indexes are provided.

Dalton, C., and E. Hohmann (Edit.) (1972) Conceptual design of a lunar colony, NASA CR-129164, 529p.
Abs.: A system engineering study is presented for a proposed lunar colony. The lunar colony was to grow from an existent, 12-man, earth-dependent lunar surface base and was to utilize lunar resources, becoming as earth-independent as possible. An in-depth treatment of some of the aspects of the lunar colony was given. The study found that the use of lunar resources is feasible for oxygen production (both for breathing and for space

Space Habitats and Nonterrestrial Resources...(cont'd)

tug fuel), food production, and building materials. A program is outlined for recycling waste materials developed at the colony as well as a full program for growth and research activity of the colony to a level of 180 colonists. Recommendations for the lunar colony are given.

DeNevi, D.P. (1978) To the Edges of the Universe, Celestial Arts, Millbrae, California, 218p.
Abs.: (1) Space Colonies, (2) Space Science, (3) Outer Space-Exploration.

Golden, F. (1977) Colonies in Space: The Next Giant Step, Harcourt Brace and Jovanovich, New York, 145p., $8.95.

Grey, J. (Edit.) (1977) Space Manufacturing Facilities: Space Colonies (1 and 2), (Proceedings of a Conference) American Institute of Aeronautics and Astronautics, v.2: 356p.

*Heppenheimer, T.A. (1978) Colonies in Space, Warner Books, N.Y., 321p., $2.50.
Abs.: A different look at the space colony concept, this book emphasizes the details of construction, manufacturing, travel, and life support. A good companion piece to O'Neill's The High Frontier.

Johnson, R.D., and C. Holbrow (Edit.) (1977) Space Settlements: A Design Study, NASA SP-413, 185p., $5.00.
Abs.: This book is the product of a two-week conference involving scientists, engineers, architects, humanists, and students, all concerned about the problems and possibilities of human habitations in space. Specific articles in the book discuss physical and psychologic effects of zero gravity; placement of stations in space; sources of food, water, and power; mining the Moon and asteroids for raw materials; and even the selection of people for the first extraterrestrial community.

Langford, D. (1970) War in 2080: The Future of Military Technology, William Morrow and Co., New York, 229p. $12.95.

McVey, J. W. (1979) Space Weapons, Space War, Stein and Day, Briarcliff Manor, NY, 245p., $9.95.

NASA SP-428 (1979) Space Resources and Space Settlement, 228p.
Abs.: Discussion of resources needed for life support for various types of habitats.

Space Habitats and Nonterrestrial Resources...(cont'd)

*O'Neill, G.K. (1977) The High Frontier: Human Colonies in Space, Bantam Books, 344p., $2.75.
Abs.: Written by the originator of the modern space colony concept, this book describes in simple, readable language how thousands of people might live and work in space in the near future. The book provides discussions about space resources, commuting, family life, living conditions, climate, agriculture, manufacturing, economics, and investment possibilities.

*Ruzic, Neil P. (1965) The Case for Going to the Moon, G. P. Putnam's Sons, New York, NY, 240p. $4.95.
Abs.: A pre-Apollo discussion of the benefits--technical, economic, social and scientific--to be had by going to the moon. Written by the editor of the magazine Industrial Research, the book describes in lively, non-technical language the future uses of the moon as a laborabory for vacuum research, as a collector of solar energy, as a source of raw materials, and as a platform for new instruments to probe the universe and search for extraterrestrial life. Some of the predictions--especially the theories about the nature of lunar rocks--have been made obsolete by the Apollo discoveries, but most of the text is still a valuable and convincing statement of why we went to the moon and why we should return there in the future.

*Ruzic, N. P. (1970) Where the Winds Sleep, Doubleday and Co., Inc., Garden City, NY, 236p.
Abs.: A post-Apollo mixture of science-fiction and technological predictions, this book is a "future history" of the habitation and use of the moon. Written in simple, entertaining language by the editor of Industrial Research, the book describes the major activities of humans on the moon--exploring a new world, operating cryogenic and vacuum industries, mining raw materials, building cities, and studying the solar system and the universe in ways impossible from earth. Despite the overly optimistic timetable, the book provides a solid summary of the future value of the moon--whenever we want to go back.

ORIGIN OF LIFE - EXTRATERRESTRIAL LIFE

Buvet, R. and C. Ponnamperuma, (Edits.) (1971) Molecular Evolution I: Chemical Evolution and the Origin of Life, North-Holland, Amsterdam.
Abs.: A classic reference.

Calvin M. (1969) Chemical Evolution, Oxford University Press, New York.
Abs.: A classic reference.

Chandler, D.L. (1977) Life on Mars, E.P. Dutton, New York, 212p., $9.95.

DeVincenzi, D. (1976) "Extraterrestrial Life," In: McGraw-Hill Yearbook of Science and Technology. McGraw-Hill, Inc., New York, p. 237.

*Dickerson, R. E. (1978) "Chemical Evolution and the Origin of Life," Scientific American 239: 70-86, September 1978.
Abs.: Theories on the origin of life are reviewed, and the synthesis of chemical compounds essential for life is discussed.

*Folsome, C. E. (1979) The Origin of Life: A Warm Little Pond, W. H. Freeman and Co., San Francisco, CA.
Abs.: A text.

Fox, S. W. (Edit.) (1965) The Origins of Prebiological Systems and Their Molecular Matrices, Academic Press, NY.
Abs.: A classic reference.

*Hynek, J.A.: The UFO Experience: A Scientific Inquiry, Ballantine Books, 309p., $2.25.
Abs.: A combination memoir and UFO casebook, written by a veteran investigator of UFO reports. An interesting look at what UFO's may tell us about extraterrestrial travelers, combined with some interesting insights into what the whole UFO phenomenon tells us about ourselves.

*Jastrow, R. (1977) Until the Sun Dies, W. W. Norton and Co., NY, 165p.
Abs.: This book gives a popular account of the forces that have shaped human beings into their present form and created the power of human intelligence, and considers the prospects for intelligent life on other planets in the solar system and elsewhere in the universe.

Origins of Life - Extraterrestrial Life...(cont'd)

Jastrow, R. and A. G. W. Cameron (Edits) (1963) Origin of the Solar System, Academic Press, NY.
Abs.: A classic reference.

*Klass, P.J.: UFO's Explained, Vintage Books, 438p., $2.45.
Abs.: Not a book to be popular with UFO "true believers", this one describes in meticulous detail how classic UFO reports are the result of natural phenomena and/or human error. Klass' painstaking detective work on UFO's should be read by anyone interested in obtaining a balanced view of the whole UFO controversy. Arthur C. Clarke calls this book, "a welcome breath of sanity in a field where it is sadly lacking."

*Life: Origin and Evolution (1979), W. H. Freeman and Company, San Francisco, CA, 148p.
Abs.: Readings from Scientific American with introductions by Clair Edwin Folsome. Topics include: formation and early evolution of the earth; prebiotic chemistry; protocells and fossils; the early evolution of life; and extraterrestrial life.

Mallove, E. F., M. M. Connors, R. L. Forward, and Z. Paprotny (1978) A Bibliography on the Search for Extraterrestrial Intelligence, Ames Research Center, NASA, Moffett Field, CA, 135p. NASA RP-1021.
Abs.: Entries by first author, with cross-reference by topic index and by periodical index.

Margulis, L. (1970) Origin of the Eucaryotic Cells, Yale University Press, New Haven, CT.
Abs.: A classic reference.

Miller, S. L. (1953) "A Production of Amino Acids Under Primitive Earth Conditions," Science, 117(3046): 528.
Abs.:..A classic reference.

Morrison, P., J. Billingham, and J. Wolfe (Edit.) (1977) The Search for Extraterrestrial Intelligence (SETI), NASA SP-419, 289p.
Abs.: A technical document that contains the results of several workshops held at NASA's Ames Research Center. The contents are divided between the rationale to justify

Origin of Life - Extraterrestrial Life...(cont'd)

undertaking a SETI program now (using radio astronomy to "listen") and a number of articles on related problems: detection of other planetary systems, search methods and regions, and general speculations on cosmic evolution. A well-produced sourcebook for the technical reader who wants an in-depth exposure to SETI.

NASA CR-114445 (1971) Project Cyclops: A Design Study of a System for Detecting Extraterrestrial Intelligent Life, 243p.

NASA SP-328 (1973) Life Beyond Earth and the Mind of Man, 106p., $1.60.
Abs.: Abridged transcript of a symposium sponsored by NASA and Boston University exploring the implications of intelligent life existing on the planets of distant stars. The six distinguished panelists include a theologian, an anthropologist, a physicist, a biologist and two astronomers.

Noda, H., (Edit) (1978) Origin of Life, Center for Academic Publications Japan/Japan Scientific Societies Press, Tokyo, 637p.
Abs.: Proceedings of the 2nd ISSOL Meeting and the 5th ICOL Meeting, held April 5-10, 1977 in Kyoto, Japan. Major topics in the papers in this volume include material environment for origins of life, prebiotic formation of small biological molecules, prebiotic formation of biological macromolecules, origin of optical activity, formation of prebiotic organization, biochemical evolution, early biological evolution, and general and theoretical aspects of origin of life.

Oparin, A. I. (1957) The Origin of Life on Earth, Oliver & Boyd.
Abs.: A classic reference.

Oparin, A. I. (1957) The Origin of Life on Earth, Academic Press, NY.
Abs.: A classic reference.

Oparin, A. I. (1953) The Origin of Life, Dover Publications, NY.
Abs.: A classic reference.

Origin of Life - Extraterrestrial Life...(cont'd)

Origins of Life, Editor: Cyril Ponnamperuma.
Abs.: An international journal devoted to the scientific study of the origin of life.

Pleasant, L. G. and C. Ponnamperuma (1979) "Chemical Evolution and the Origin of Life: Bibliography Supplement 1977," Origins of Life, 10 (1980), 69-87.
Abs.: 358 references. This bibliography is the eighth annual supplement to the comprehensive bibliography on the same subject which was published in Space Life Science 2(1970), 225-295; 3(1972), 293-304; 4(1973), 309-329; and in Origins of Life 5(1974), 507-527; 6(1975), 285-300; 7(1976), 75-85; 8(1977), 59-66, 9(1978), 67-74.

Pleasant, L. G. and R. S. Young (1979) Publication of the Planetary Biology Program for 1978: A Special Bibliography, Scientific and Technical Information Branch, NASA, Washington, D.C., 34p. NASA TM-80745.
Abs.: List of 1978 publications resulting from research pursued under the auspices of NASA's Planetary Biology Program. The Planetary Biology Program, within the Office of Space Science of NASA, is the first and only integrated program to methodically investigate the planetary events which may have been responsible for, or related to, the origin, evolution and distribution of life in the universe. Lists also available for the years 1977(NASA TM-80338), 1976(NASA TM-75017), and 1975(NASA TM-X-74313).

Ponnamperuma, C. (Edit.) (1978) Comparative Planetology, Academic Press, New York, 275p.
Abs.: Proceedings of the 3rd College Park Colloquium on Chemical Evolution, held September 29 thru October 1, 1976, at the University of Maryland. Papers include information on the interiors of planets, crustal evolution, the origin of planetary atmospheres, and the question of life itself.

Ponnamperuma, C. (1976) "Life Beyond the Earth," Astronautics & Aeronautics, 14(11): 50-55.
Abs.: The existence of life on other planets as compared to the evolution of life on earth is discussed. The discussion is highlighted by historical references to life science theoreticians and by the Viking landings on Mars and sampling of the Martian soil.

Origin of Life - Extraterrestrial Life...(cont'd)

Sachs, M., and E. Jahn (1977) Celestial Passengers: UFO's and Space Travel, Penguin Books, 220p. $2.95.
Abs.: An interesting and readable book that combines strange visitors to Earth, the possibilities of extraterrestrial life, UFO case histories, and speculations about our own future as space travellers. A good introductory book for readers who want to cover this wide range of related topics without going into details.

*Sagan, C. (1975) The Cosmic Connection: An Extraterrestrial Perspective, Dell Publishing Co., $1.75.
Abs.: Short and witty essays about other worlds and the possibilities of intelligent life on Earth and elsewhere, with ideas about what extraterrestrial civilizations might be like.

*Schopf, J. W. (1978) "The Evolution of the Earliest Cells," Scientific American, 239: 110-112, September.
Abs.: Prokaryotes and eukaryotes are distinguished, and the evolution of eukaryotic algae and prokaryotic heterotrophic bacteria, photosynthetic bacteria, and cyanobacteria is discussed.

Scientific Results of the Viking Project, (1977), American Geophysical Union, Washington, D.C.
Abs.: Reprint of Journal of Geophysical Research, Volume 82. Includes over 50 articles on the Viking Project which launched two unmanned spacecraft to Mars in 1975 for scientific exploration with special emphasis on the search for life.

Shklovskii, I.S., and C. Sagan (1968) Intelligent Life in the Universe, Dell/Delta, New York.
Abs.: A thorough and readable description of the solar system, the universe, the origin of life, and the possibilities for life on other worlds.

Urey, H. C. (1952) The Planets, Their Origin and Development, Yale University, New Haven, CT.
Abs.: A classic reference.

UFO'S

Hynek, J. A., The UFO Experience: A Scientific Inquiry, Ballantine Books, paperback, 309p., $2.25.
Abs.: A combination memoir and UFO casebook, written by a veteran investigator of UFO reports. An interesting look at what UFO's may tell us about extraterrestrial travellers, combined with some interesting insights into what the whole UFO phenomenon tells us about ourselves.

*Klass, P. J., UFO's Explained, Vintage Books, paperback, 438p., $2.45.
Abs.: Not a book to be popular with UFO "true believers," this one describes in meticulous detail how classic UFO reports are the result of natural phenomena and/or human error. Klass' painstaking detective work on UFO's should be read by anyone interested in obtaining a balanced view of the whole UFO controversy. Arthur C. Clarke calls this book, "a welcome breath of sanity in a field where is is sadly lacking."

*Sachs, M. and E. Jahn (1977) Celestial Passengers: UFO's and Space Travel, Penquin Books, paperback, 220p., $2.95.
Abs.: An interesting and readable book that combines strange visitors to earth, the possibilities of extraterrestrial life, UFO case histories, and speculations about our own future as space travellers. A good introductory book for readers who want to cover this wide range of related topics without going into details.